As approved by EEWHG Executive Committee January 27, 2000

ARAC EEHWG Report
For FAR/JAR 25.581

1 - What is underlying safety issue addressed by the FAR/JAR?

FAR/JAR 25.581 defines the requirement to protect airplane structure from catastrophic damage that result from lightning strikes. Lightning strikes to transport airplanes are common, and this regulation provides the requirement to protect from the effects of lightning strikes. Service history, which includes transport airplane accidents, shows the need for structure lightning protection.

2 - What are the current FAR and JAR standards?

Sec. 25.581 Lightning protection.

(a) The airplane must be protected against catastrophic effects from lightning.

(b) For metallic components, compliance with paragraph (a) of this section may be shown by--
(1) Bonding the components properly to the airframe; or
(2) Designing the components so that a strike will not endanger the airplane.

(c) For nonmetallic components, compliance with paragraph (a) of this section may be shown by--
(1) Designing the components to minimize the effect of a strike; or
(2) Incorporating acceptable means of diverting the resulting electrical current so as not to endanger the airplane.

Amdt. 25-23, Eff. 5/8/70

JAR 25.581 Lightning protection

(a) The aeroplane must be protected against catastrophic effects from lightning. {See JAR 25X899 and ACJ 25.581.}

(b) For metallic components, compliance with sub-paragraph (a) of this paragraph may be shown by--
(1) Bonding the components properly to the airframe; or
(2) Designing the components so that a strike will not endanger the airplane.

(c) For nonmetallic components, compliance with sub-paragraph (a) of this paragraph may be shown by--
(1) Designing the components to minimize the effect of a strike; or
(2) Incorporating acceptable means of diverting the resulting electrical current so as not to endanger the airplane.

3 - What are the differences in the standards and what do these differences result in?:

The only difference between FAR 25.581 and JAR 25.581 is that JAR 25.581 references JAR 25X899 and ACJ 25.581 in paragraph (a).

FAR 25 does not have a regulation the same as JAR 25X899. This is being addressed by the ARAC Electrical Systems Harmonization Working Group. FAA also does not have an advisory circular equivalent to ACJ 25.581. These differences do not result in differences in design capability, safety margin, or stringency. This is because the lightning

requirements in JAR 25X899 and its associated ACJ 25X899 have been superseded by updated lightning environments in AC 20-53A and AC 20-136. Also, the guidance in ACJ 25.581 is quite general, is accepted as good design practice by airplane manufacturers, and is supplemented by the FAA Aircraft Lightning Protection Handbook DOT/FAA/CT-89/22.

4 - What, if any, are the differences in the means of compliance?

There is no substantive difference complying with FAR 25.581 and JAR 25.581. See the discussion above on the ACJ 25.581.

5 – What is the proposed action?

The proposal is to make a minor change to JAR 25.581 to revise the reference to JAR 25X899 to be JAR 25.899. Revise FAR 25.581 to refer to FAR 25.899. In addition, ACJ 25.581 should be modified to replace the reference to ACJ 25X899 with references to the updated lightning environment and test waveform documents from SAE and EUROCAE. FAA should then adopt an AC 25.581 equivalent to ACJ 25.581.

FAA and JAA should request SAE and EUROCAE lightning technical committees prepare updated technical guidance on structures lightning protection, which may be considered for a future revision to AC/ACJ 25.581.

6 - What should the harmonized standard be?

Proposed Rule:

FAR/JAR 25.581 Lightning protection

(a) The airplane (aeroplane) must be protected against catastrophic effects from lightning. {See FAR/JAR 25.899 and (for JAR only) ACJ 25.581.}

(b) For metallic components, compliance with (sub-)paragraph (a) of this section (paragraph) may be shown by--
  (1) Bonding the components properly to the airframe; or
  (2) Designing the components so that a strike will not endanger the airplane.

(c) For nonmetallic components, compliance with (sub-)paragraph (a) of this section (paragraph) may be shown by--
  (1) Designing the components to minimize the effect of a strike; or
  (2) Incorporating acceptable means of diverting the resulting electrical current so as not to endanger the airplane.

Proposed AC/ACJ Revision:

AC/ACJ 25.581

Lightning Protection (Acceptable Means of Compliance and Interpretative Material) (Section 2.1 only shown, other sections unchanged)

2.1 External non-metallic parts should be so designed and installed that -

a. They are provided with effective lightning diverters which will safely carry the lightning discharges described in SAE ARP 5412/EUROCAE ED-84 "Aircraft Lightning Environment and Related Test Waveforms".
b. Damage to them by lightning discharges will not endanger the aeroplane or its occupants, or
c. A lightning strike on the insulated portion is improbable because of the shielding afforded by other portions of the aeroplane. Where lightning diverters are used the surge carrying capacity and mechanical robustness of associated conductors should be at least equal to that required for primary conductors.

7 - How does this proposed standard address the underlying safety issue (identified under #1)?

No change.

8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain.

No change. Only the advisory material would change, and this would reflect the currently accepted means of compliance.

9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety?

No change. The rules are not changing, there are no significant changes to the advisory material, and there is no significant change to industry practice.

10 - What other options have been considered and why were they not selected?

Option 1. Have JAA delete ACJ 25.581. This was rejected because ACJ 25.581 provides good general guidance that is acceptable to regulatory authorities and industry.
Option 2. Develop new advisory material. This was rejected at this time, because the existing ACJ 25.581 provides adequate general guidance, and new advisory material would take 3 to 5 years to develop and adopt.

11 - Who would be affected by the proposed change?

The proposed change would have minor effects to manufacturers. Their certification plans would now reference AC 25.581.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?

No advisory material needs to be included in the rule text or preamble. No significant US rule change is expected.

13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted?

No FAA advisory material exists. ACJ 25.581 should be adopted as a FAA advisory circular, with minor changes to update references.

14 - How does the proposed standard compare to the current ICAO standard?

There is no existing equivalent ICAO standard.

15 - Does the proposed standard affect other HWG's?

This proposal reflects agreement between ESHWG and EEHWG to revise and adopt FAR/JAR 25.899.

16 - What is the cost impact of complying with the proposed standard?

There is no cost impact.

17 - Does the HWG want to review the draft NPRM at "Phase 4" prior to publication in the Federal Register?

Yes.

18 – In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process.

Yes. The changes are minor and not controversial.